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Marin

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(54) **EXTERNAL FIXATOR ASSEMBLY**

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This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

(63) Continuation of application No. 12/284,891, filed on Sep. 25, 2008, now Pat. No. 7,887,498, which is a continuation-in-part of application No. 11/903,834, filed on Sep. 25, 2007, now Pat. No. 7,806,843.

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A61F 5/00 (2006.01)

(52) **U.S. Cl.** **602/23; 602/27; 606/54**

(58) **Field of Classification Search** **602/23, 602/27; 606/53-57, 240-241**
See application file for complete search history.

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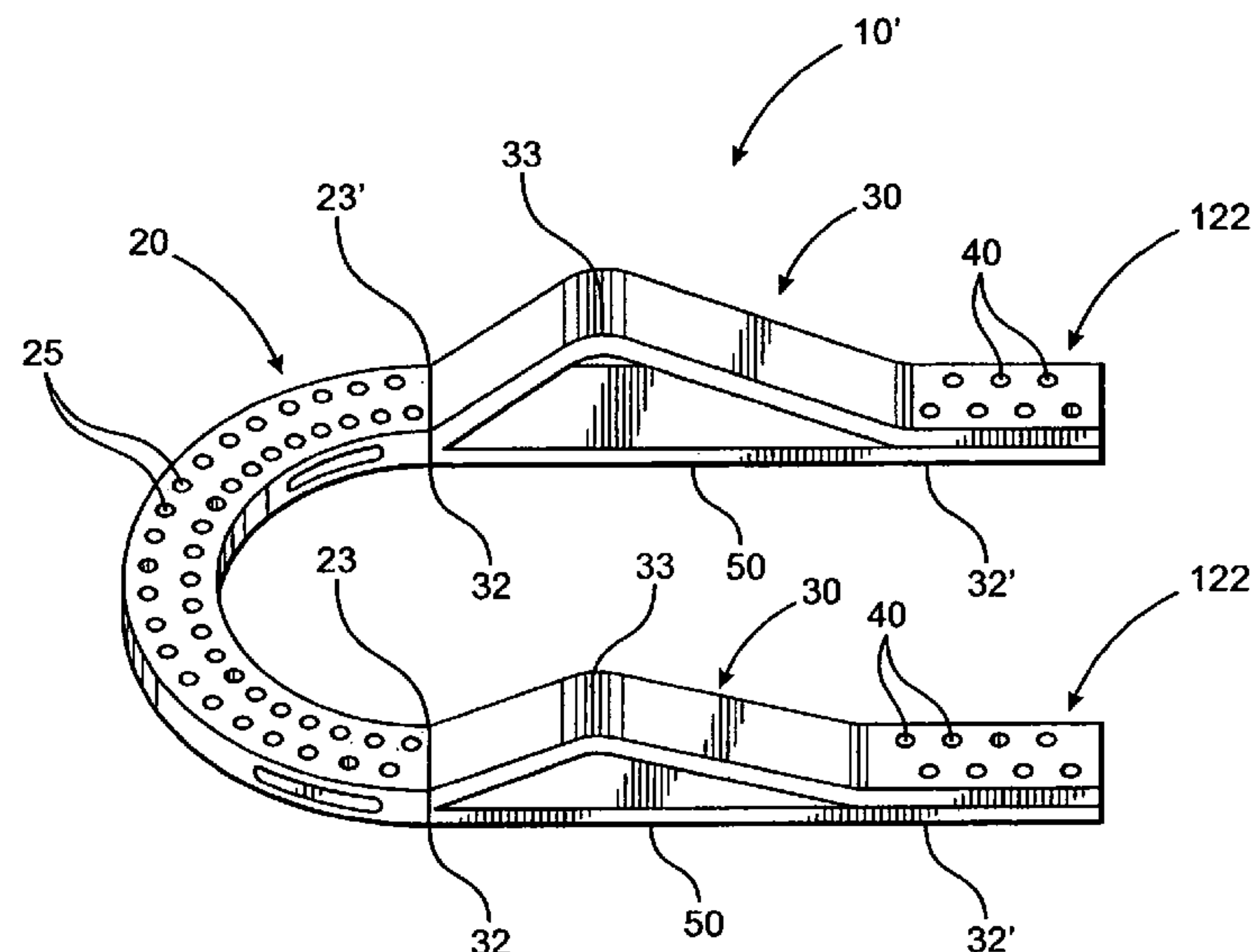
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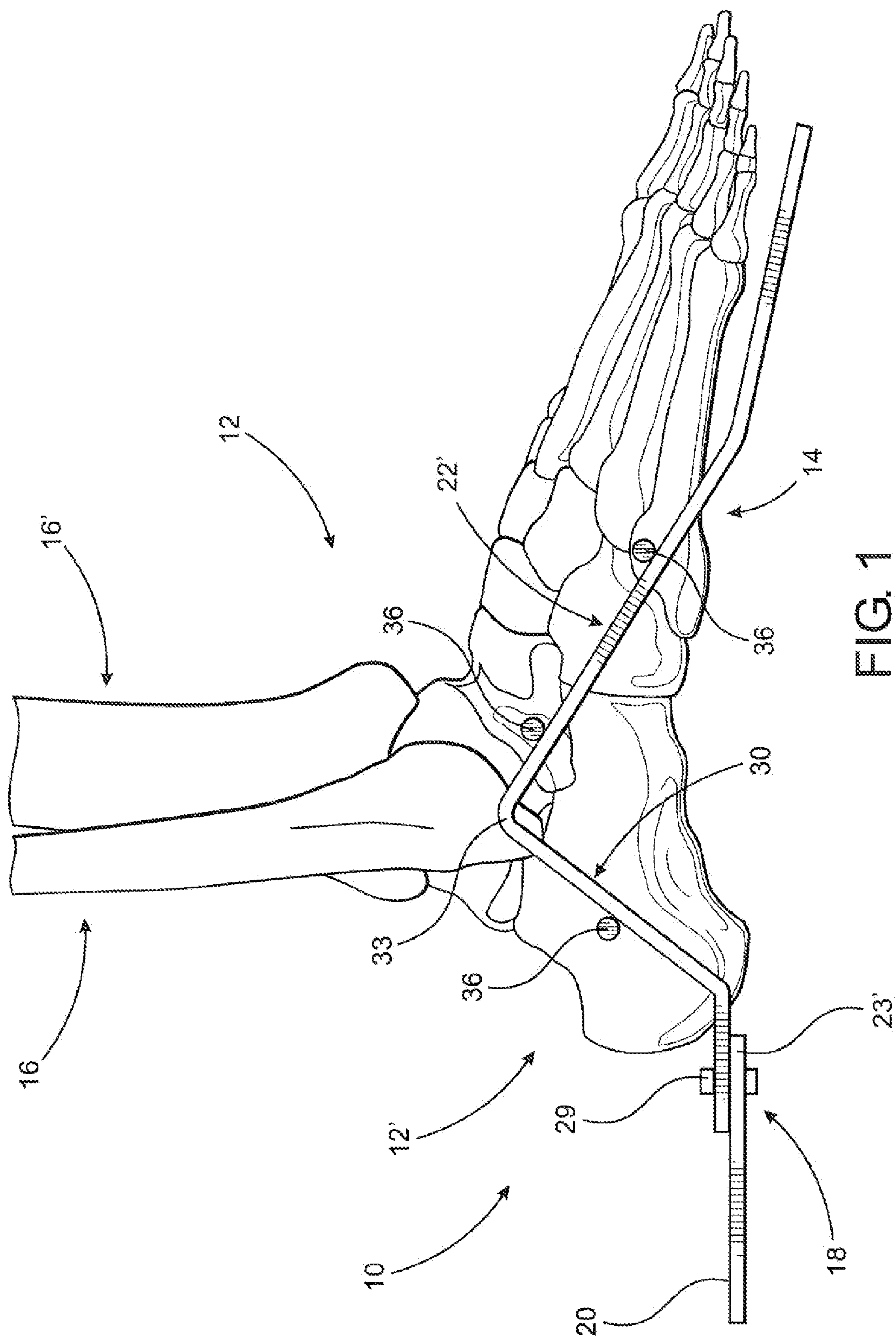
(57) **ABSTRACT**

An external fixator assembly structured for placement and use substantially adjacent the ankle area of the body and including a support assembly comprising at least one base segment and one or two contoured segments disposed substantially on opposite sides of the ankle area. Each of the contoured segments includes a contoured portion having a either different or substantially equivalent angular and/or convergent configurations disposed along a length or height of the ankle area. At least one transfixion member may be connected along the length of the contoured portion(s) as well as a remainder of the contoured segment(s) so as to extend transversely inward there from into operative engagement with tissue associated with the ankle area patient's body.

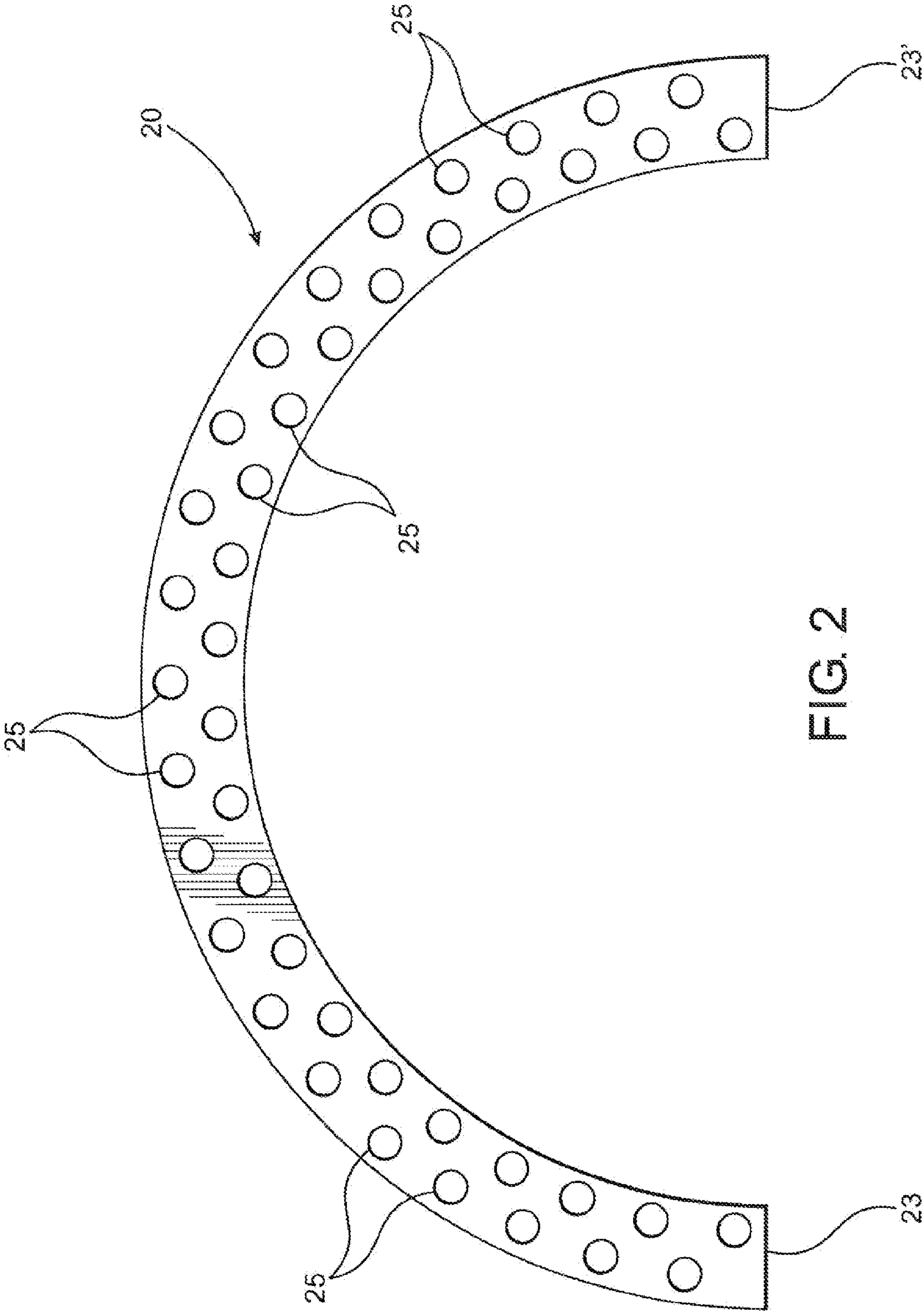
6 Claims, 9 Drawing Sheets

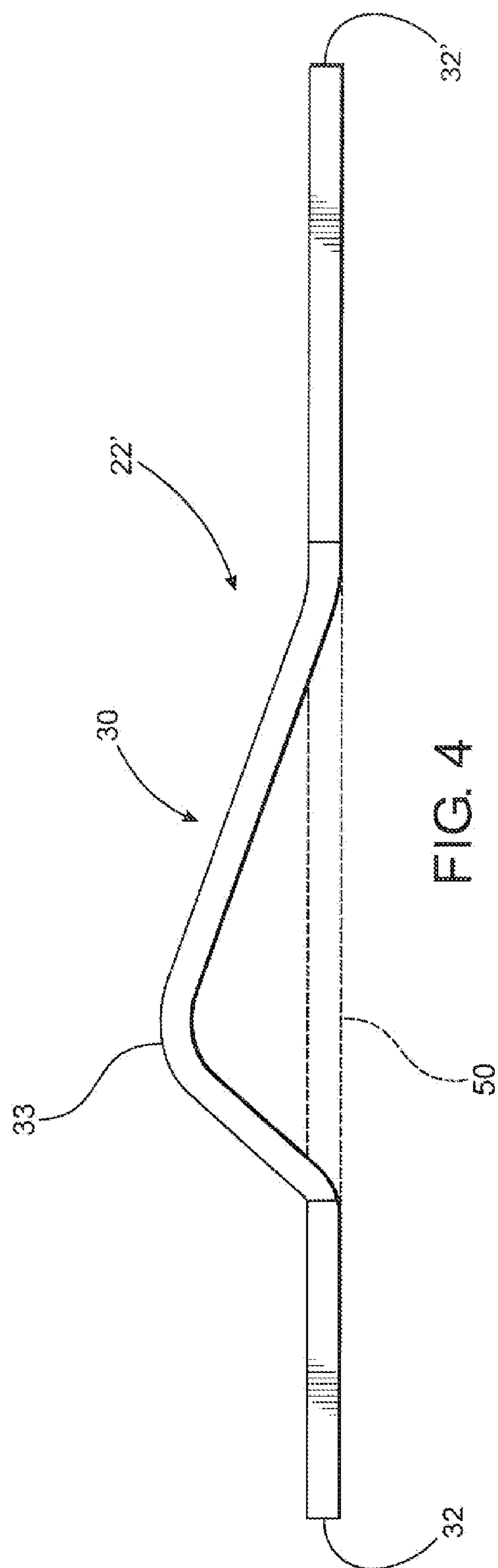
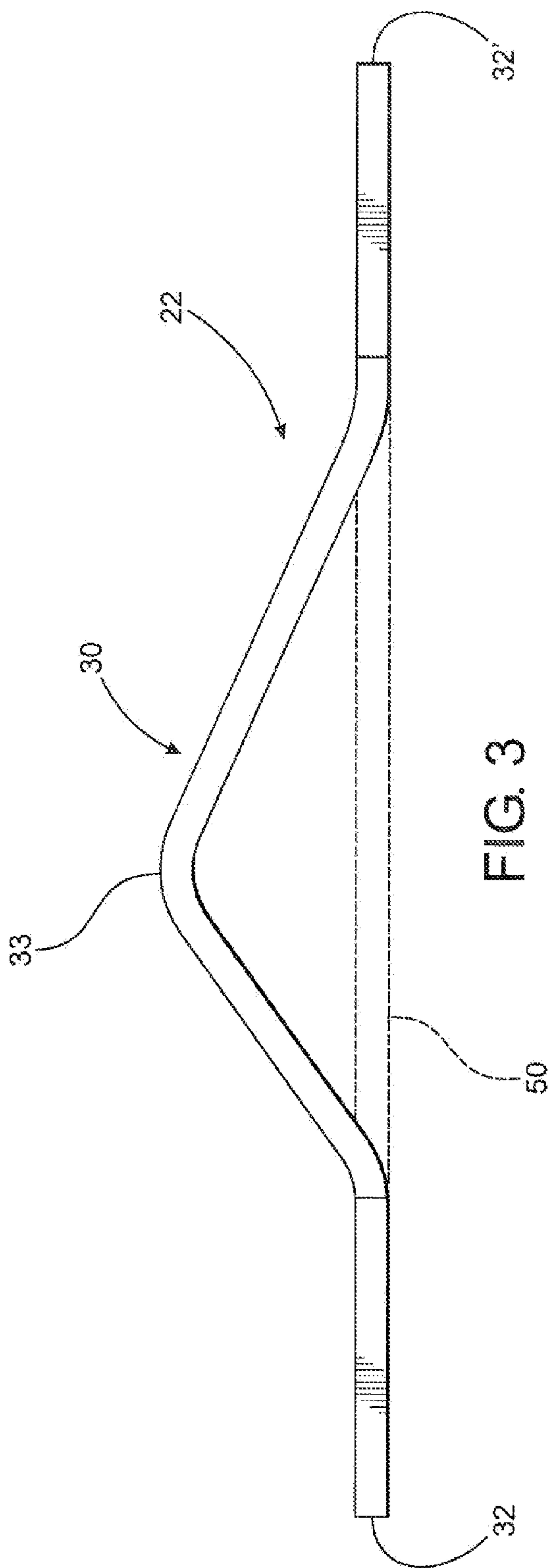


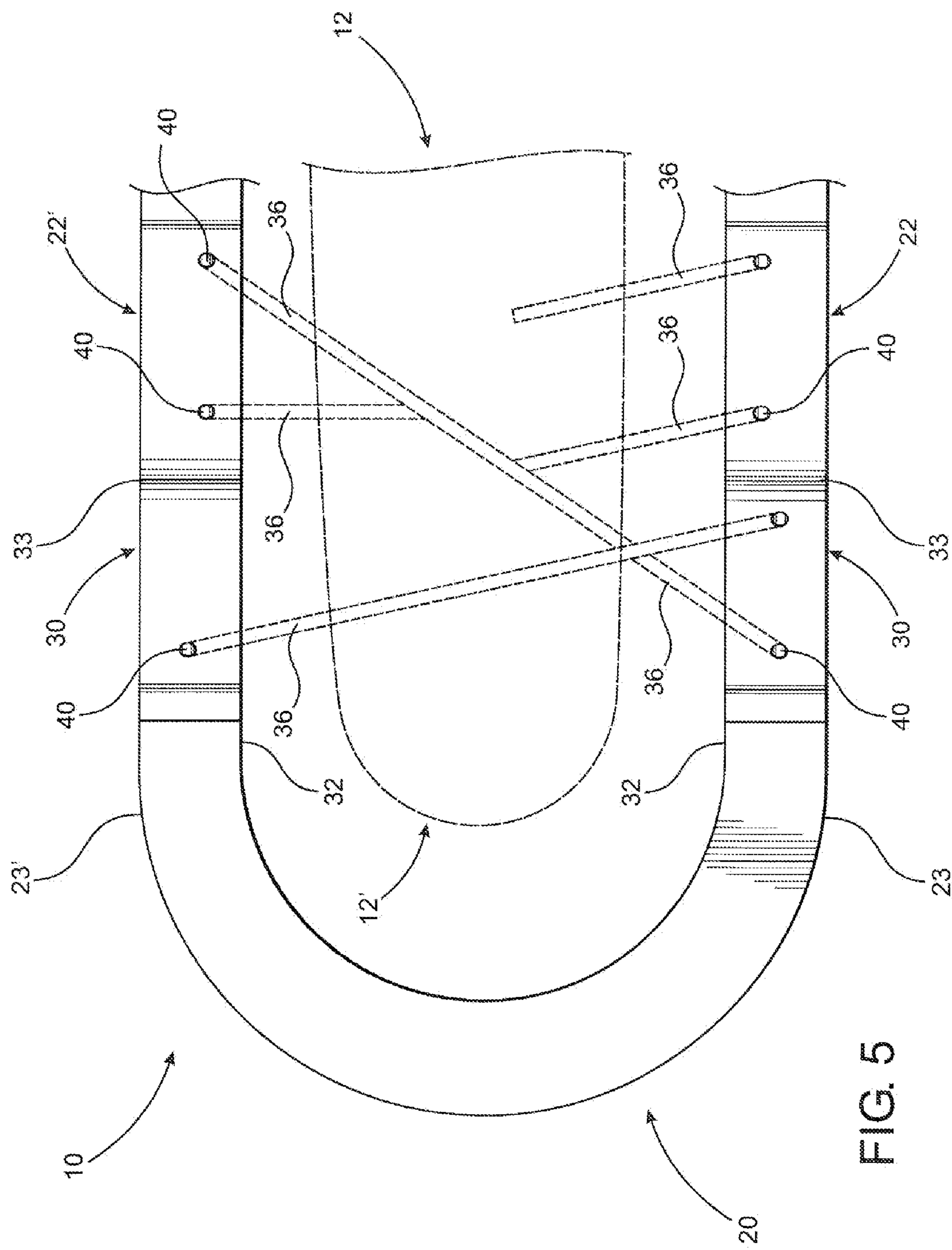
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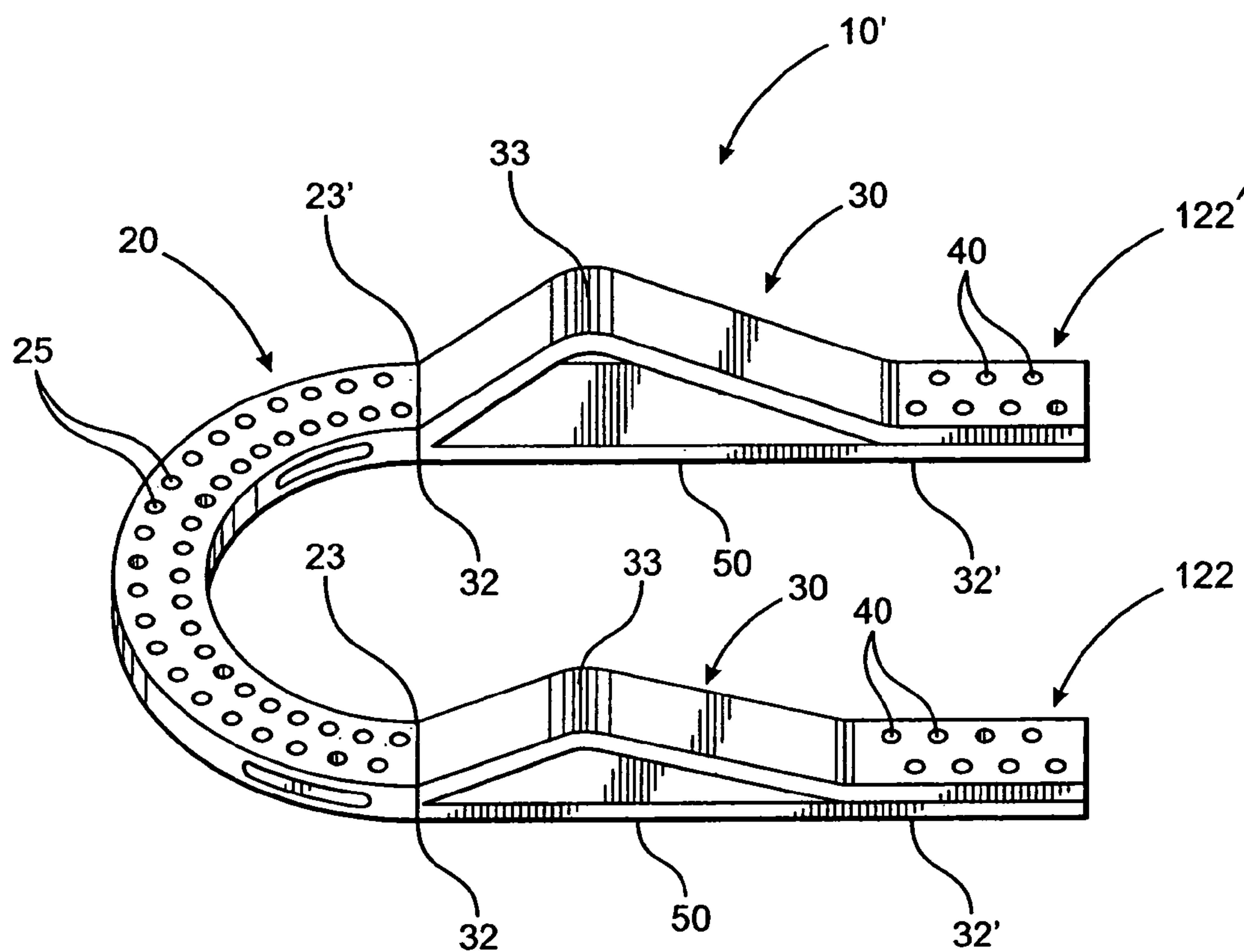


FIG. 6

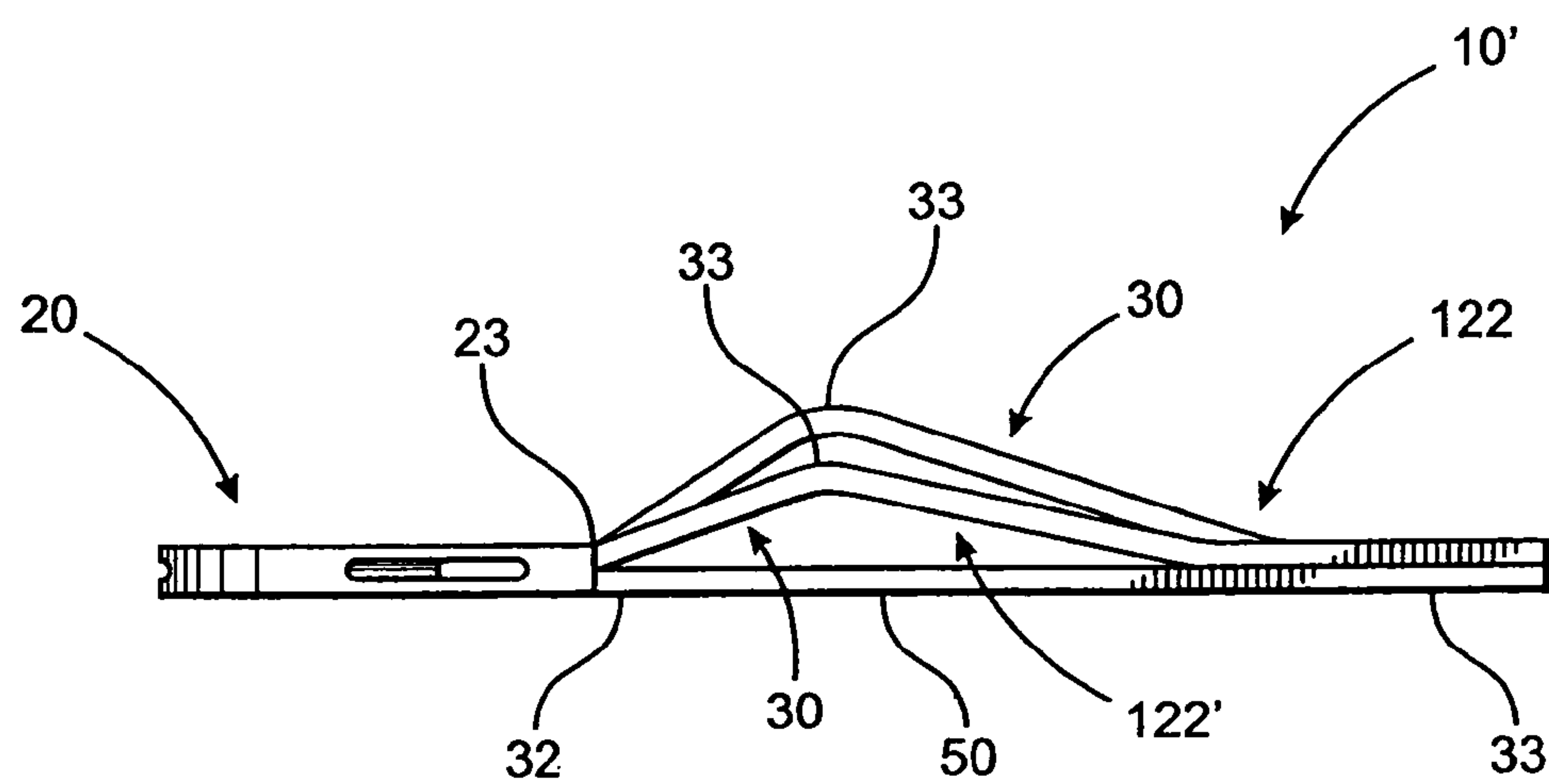


FIG. 7

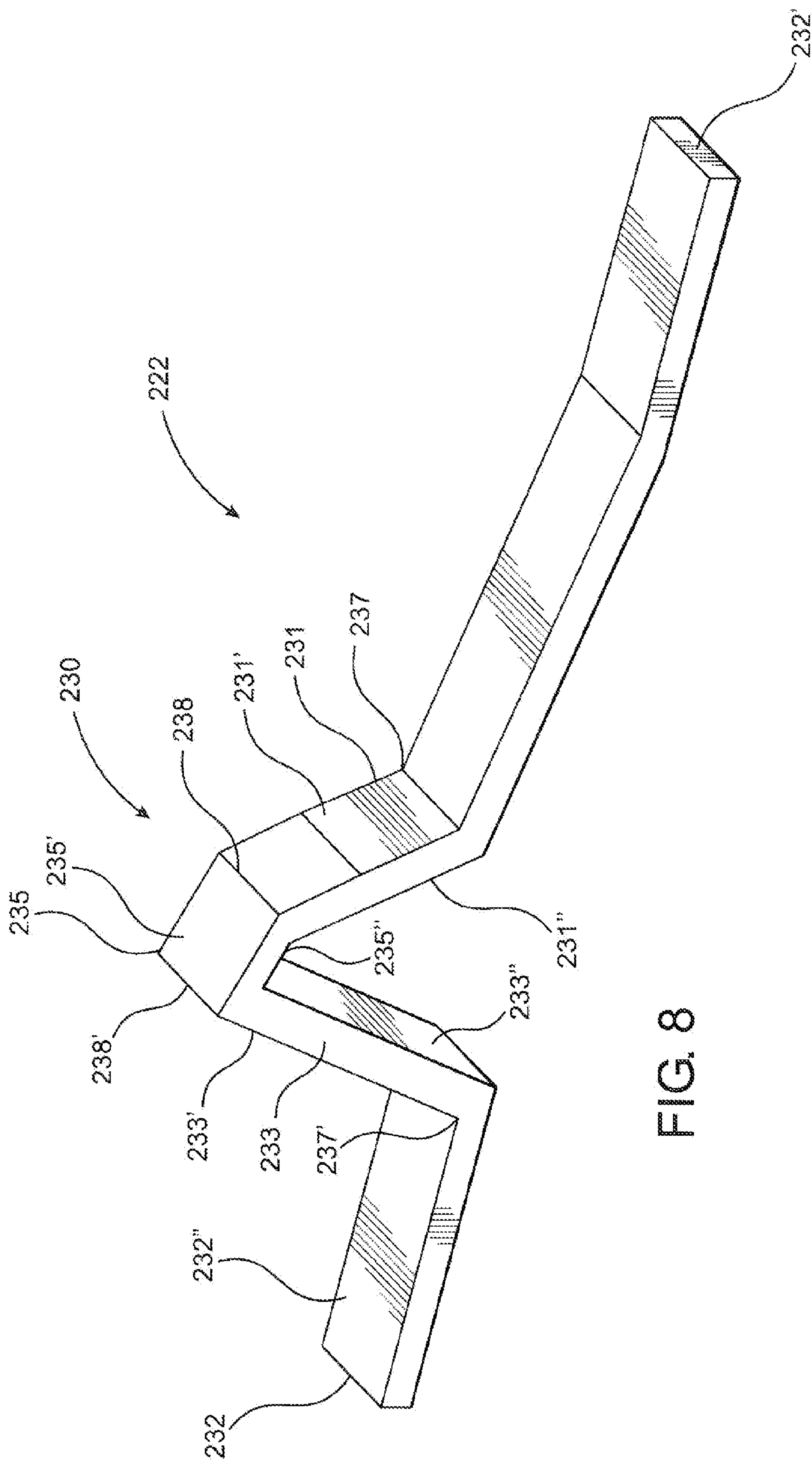
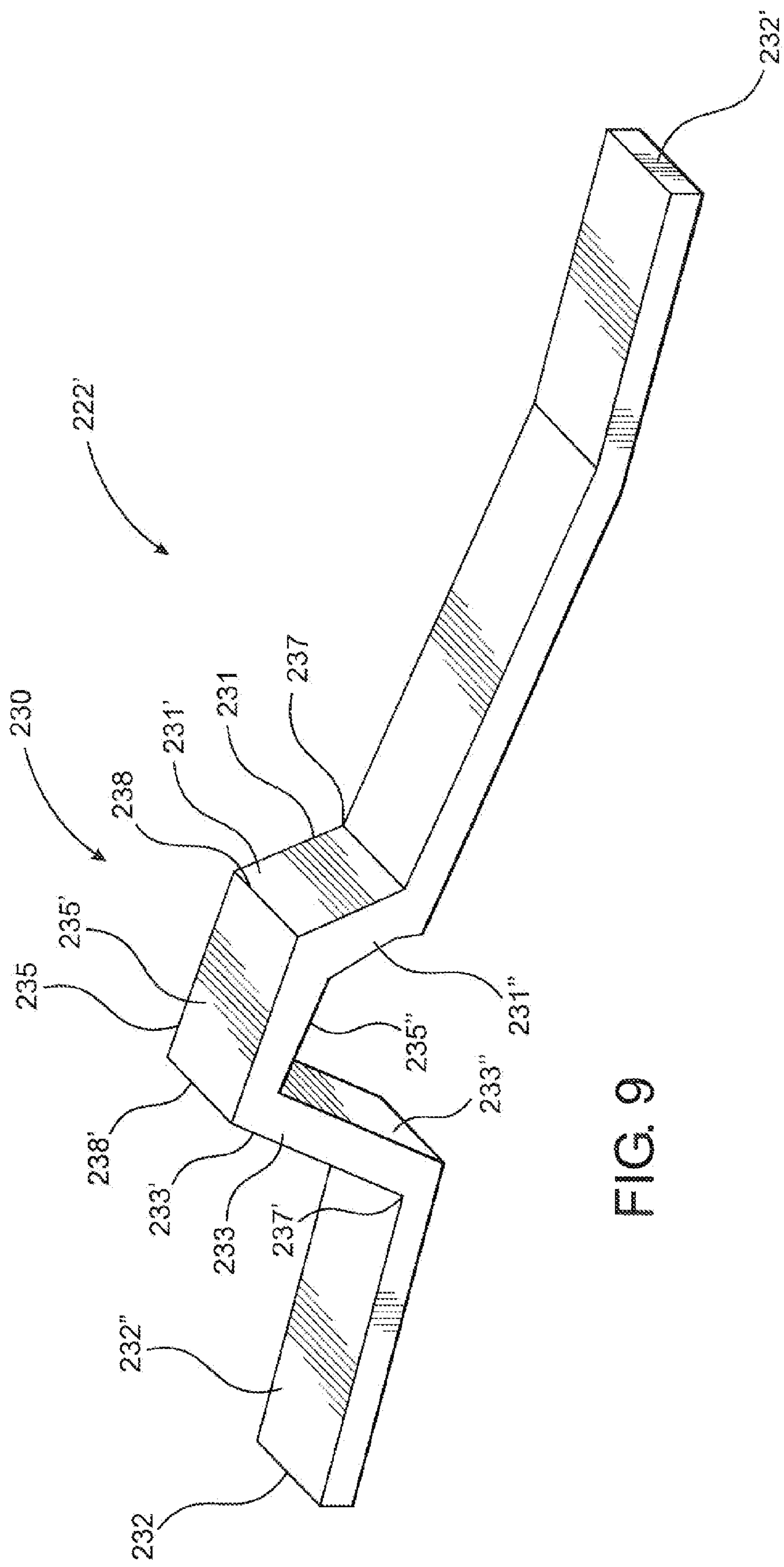
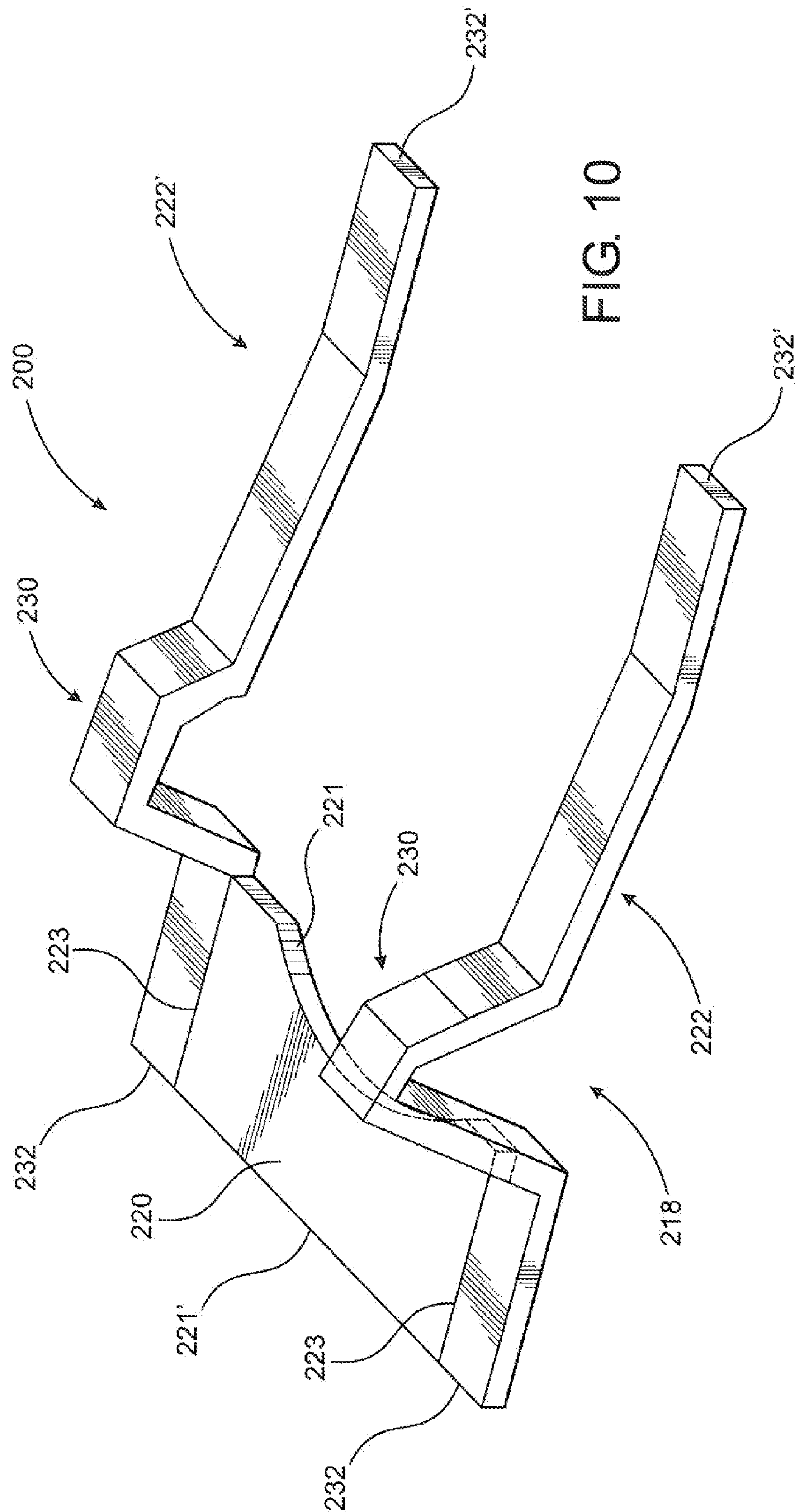


FIG. 8





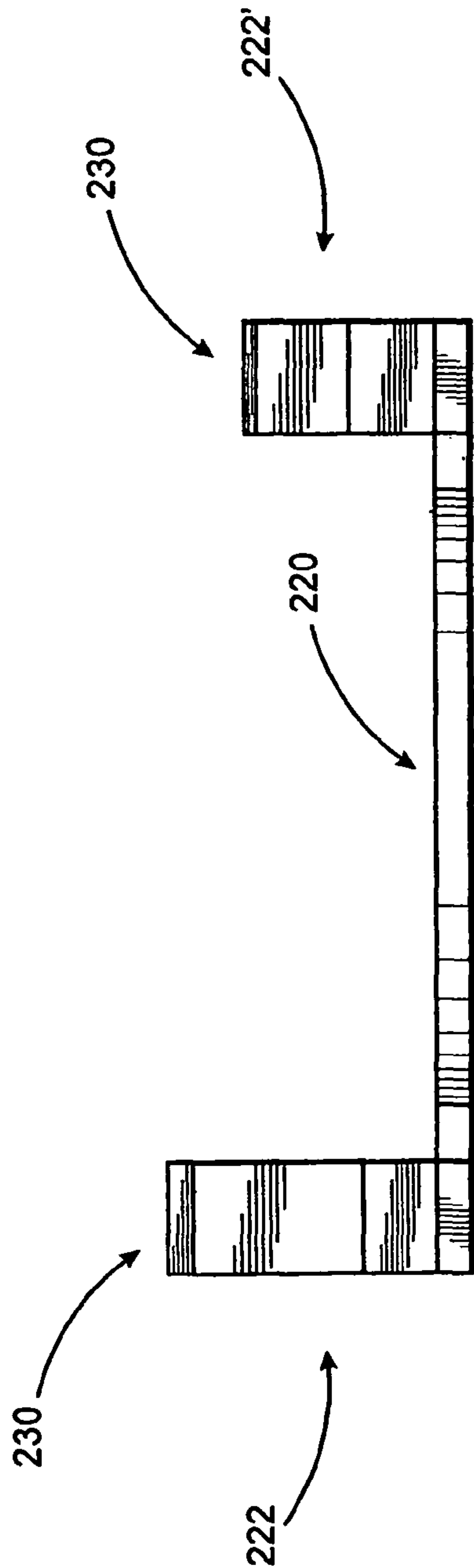


FIG. 11

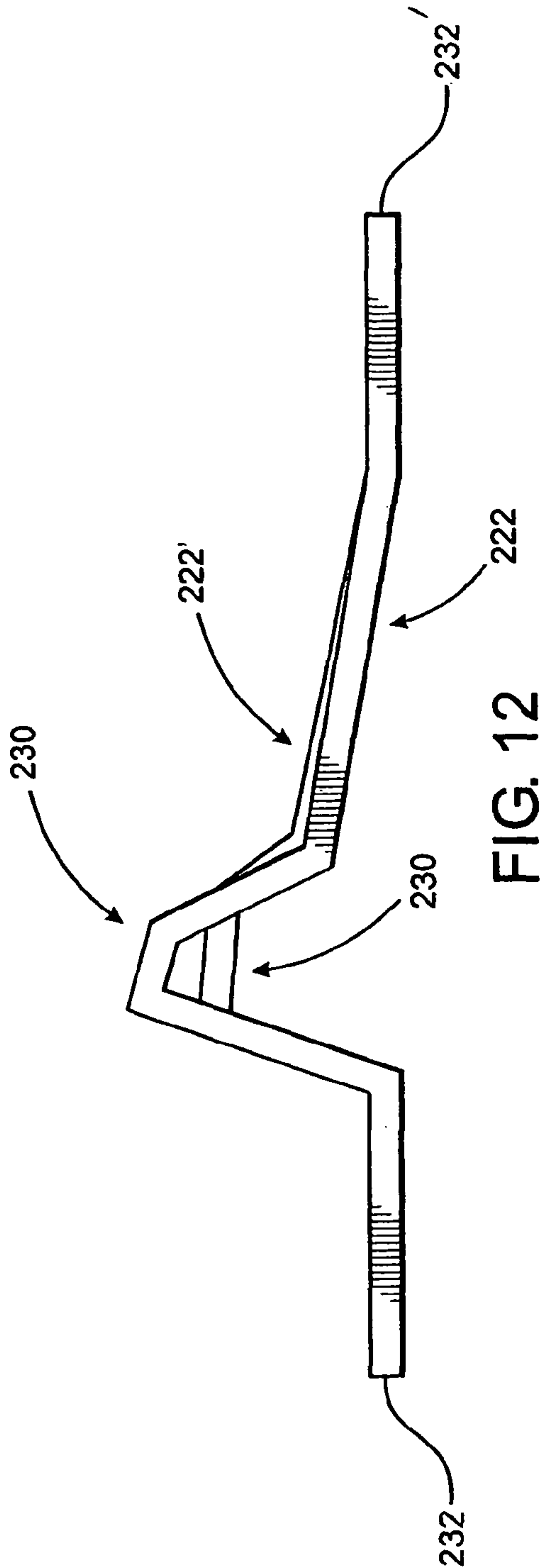


FIG. 12

EXTERNAL FIXATOR ASSEMBLY

CLAIM OF PRIORITY

The present application is a “continuation” patent application of previously filed, patent application having Ser. No. 12/284,891 filed on Sep. 25, 2008, which is set to mature into U.S. Pat. No. 7,887,498 on Feb. 15, 2010, which is a continuation-in-part patent application of previously filed, having Ser. No. 11/903,834 filed on Sep. 25, 2007, which matured into U.S. Pat. No. 7,806,843 on Oct. 5, 2010, also incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed to an external fixator assembly structured for operative placement relative to and treatment of the ankle area including the ankle joint, foot and correspondingly disposed lower leg bones. A support assembly comprises a base segment configured to at least partially surround the ankle area and one or more contoured segments each including a contoured portion. The contoured portion extends transversely outward from its contoured segment, along a length or height of the ankle or talus area and is structured to dispose one or more transfixion pins at any of a plurality of preferred orientations to engage and efficiently stabilize predetermined portions of the ankle area.

2. Description of the Related Art

In the medical treatment of pathologies including, but not limited to, injuries, fractures, etc. to the bone and joints, external fixator assemblies are commonly used to maintain segments of the bone in an intended and/or required stabilized orientation. By way of example, fixator assemblies of the type described may be utilized to treat the fusion of bone tissue as well soft tissue injuries, and situations involving a union of bones which otherwise are difficult to heal. As such, known or conventional fixator assemblies vary in structure, dimension and configuration and are correspondingly adapted to be used with various portions of the body to which they are attached.

Typical fixator structures include one or more connecting bars or rods as well a plurality of clamps for adjustably securing fixation pins, wires, etc. to the bone portions being affected. Further, transfixion pins or wires of the types commonly utilized may extend completely through the bony tissue or may be anchored therein, such as when the long bones of the leg are involved directly or indirectly with the treatment or healing procedure. Further, the term “transfixion members” is generally recognized in the medical field as describing elongated pins which extend completely or at least partially through the bony tissue involved. In contrast, smaller, thicker “half pins” may be utilized in substantially the same manner to stabilize affected tissue, but are of a length insufficient to extend completely through the affected bone, joint, etc. This term may also be used in a more generic sense in referring to stabilizing devices, other than pins, such as wires, reduction wires, screws, clamps, etc.

In addition, known external fixator assemblies of the type described may also include support rings which encircle a corresponding body member, wherein such rings or like support members serve as a supportive base to facilitate proper location of the aforementioned transfixion members. Accordingly, it is commonly understood in the medical profession that fixator assemblies are used to maintain proper orientation of one or more of bones or bone segments relative to one another to facilitate healing or alignment.

However, the proper stabilization of tissue typically associated with the joint areas of a patient’s body such as, but not limited to, the ankle joint as well as the wrist and other smaller bones associated with the hand involves additional consider-

ations. In particular when dealing with the ankle area and the associated tissue serving to interconnect the foot to the lower portion of the leg, the fixator clamps or fixation clamps support blocks are frequently connected to an encircling halo-ring or like support member. These devices are mounted on the ring or other support member to properly position a transfixion pin or like member at a proper height or corresponding distance above the supporting ring in order to engage and thereby properly orient the affected bones of the ankle joint to the foot. In utilizing these support blocks, transfixion clamps, etc., one commonly recognized problem or disadvantage associated therewith is the possibility of these devices obscuring important or necessary portions of the ankle joint when X-rayed. In addition, the proper placement of one or more of such clamps, support blocks, etc. is time consuming for medical personnel and may lack a certain versatility and/or accuracy associated with the accurate placement of a transfixion pin or like transfixion member in the fixed orientation or otherwise support of the various bones of the ankle joint.

Accordingly, there is a need in the medical profession for an external fixator assembly which more efficiently stabilizes or otherwise serves to operatively orient the components and tissue associated with the foot and ankle areas and/or the associated bones of the lower leg corresponding to a connection with the ankle area joint and the foot.

SUMMARY OF THE INVENTION

This invention is directed to an external fixator assembly primarily, but not exclusively, structured for placement adjacent an ankle area of the body. As referred to herein, the term “ankle area” is intended to describe the ankle joint, as well as bones and associated tissue of the foot and lower portions of the leg including the fibula and tibia. Further, in properly describing the intended position and orientation of the various preferred embodiments of the external fixator assembly of the present invention, terminology including “length of the ankle area” and/or “height of the ankle area” may be utilized synonymously. These terms are meant to refer to the general distance between the bottom of the foot and an area of the lower part of the leg above the ankle joint. Further the ankle area, as used herein, is meant to be descriptive of the bones and other tissue associated with the foot, ankle joint and lower leg which serve to facilitate the functioning of the ankle joint and intended, relative movements of the corresponding foot and leg connected to the ankle joint.

Accordingly, the external fixator assembly of the present invention comprises a support assembly intended to be disposed adjacent the ankle area and structured to support at least one transfixion pin or like transfixion member in operative engagement with the bones or other associated tissue associated with the ankle area. As such, the support assembly includes at least one base segment preferably, but not necessarily having a curvilinear configuration substantially in the form of an arc and/or semi-circle operatively disposed at the medial and lateral longitudinal segments.

In addition, the support assembly includes at least one, and in some applications at least two elongated contoured segments connected to the base segment, which could also be accurately described and/or referred to as a contoured anatomical foot plate. Each of the one or more contoured segments includes a contoured portion, dimensioned and configured to medically imitate the arch of the foot. Further, the contoured portion is disposed along the length of the corresponding contoured segment and extends transversely outward from a remainder of the length of the contoured segment. Accordingly, when properly positioned adjacent the ankle area, the contoured portion extends transversely outward from its contoured segment and adjacent to and along the length or height of the ankle area. Moreover, each con-

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contoured portion includes what may be generally referred to as an angular configuration, which in turn may be more specifically defined by a substantially convergent configuration. Accordingly, the angular or convergent configuration of each contoured portion includes an apex or like structure representing the maximum outward extension of the contoured portion from a remainder of the length of the corresponding contoured segment.

Further, each contoured portion is preferably disposed in spaced relation to at least one end of the corresponding contoured segment. In at least one preferred embodiment the contoured portion is intermediately disposed between the opposite ends of the contoured segment. Interconnection of each contoured segment to the base segment of the support assembly is defined by a fixed, integral or removable attachment of one of the opposite ends of the contoured segment to a corresponding end or other appropriate portion of the base segment. As set forth above, the same base segment of the support assembly may be utilized to support and properly position at least two contoured segments. When this embodiment of the fixator assembly is utilized, opposite ends of the base segment are fixedly, integrally or removably secured to a corresponding end of each of the elongated contoured segments. Further, when so connected, each of the two contoured segments are operatively positioned on substantially opposite sides of the ankle area and in spaced but adjacent relation thereto. As such, corresponding ones of the contoured portions of each contoured segment extends transversely outward from the length of the corresponding contoured segment and along the height or length of the ankle area.

Another feature of the various preferred embodiments of the fixator assembly of the present invention, whether utilizing one or more contoured segments, is the ability to connect one or more transfixion pins or like transfixion members to the one or more contoured segments. When connected to the contoured segment(s) in the intended manner, the transfixion pin(s) or member(s) extends transversely inward, towards the affected portions of the ankle area, from the contoured segment to which it is attached into stabilizing engagement with the bone or other tissue associated with the ankle area at various points along the height or length of the ankle area. Further, each of the one or more transfixion pins can be connected to a contoured segment at a plurality of different locations along the length thereof including, but not limited to, a plurality of locations along the length of the contoured portion of the corresponding contoured segment. The angular and/or convergent configuration of the contoured portion provides significant versatility in positioning each of the one or more transfixion pins or members at any one of a plurality of different locations each representing an orientation having a different height or length relative to the ankle area.

Therefore, the positioning of the transfixion pin(s) or member(s) into stabilizing engagement with intended tissue of the ankle area, in the manner described herein, eliminates or significantly reduces the need for conventional support blocks or clamps to connect the transfixion pin(s). As set forth above, the use of such known devices and procedures for orienting the transfixion pins relative to a predetermined body part is time consuming and has a tendency to obscure X-rays or other viewing facilities of the body part. Therefore the use of the various preferred embodiments of the present invention eliminate or significantly reduce such known and well recognized disadvantages.

These and other objects, features and advantages of the present invention will become clearer when the drawings as well as the detailed description are taken into consideration.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

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FIG. 1 is a side view in partial cutaway and schematic form of the external fixator assembly of the present invention operatively positioned relative to an ankle area of a patient.

FIG. 2 is a top view of a base segment of a support assembly of the preferred embodiment of FIG. 1.

FIG. 3 is a side view of one of a possible plurality of contoured segments, normally intended for operative placement on the medial side of the ankle area and comprising a part of the support assembly along with the base segment as represented in FIG. 2.

FIG. 4 is a side view of another embodiment of one of a possible plurality of contoured segments, normally intended for placement on the lateral side and comprising a part of the support assembly of the present invention.

FIG. 5 is a top view in partial cutaway and schematic form of the fixator assembly of the present invention operatively positioned relative to the foot or lower leg portion of an ankle area of a patient.

FIG. 6 is a top perspective view in partial cutaway of another embodiment of the external fixator assembly of the present invention.

FIG. 7 is a side view of the embodiment of FIG. 6.

FIG. 8 is a perspective view of another preferred embodiment of an elongated contoured segment associated with a new embodiment of the external fixator assembly of the present invention.

FIG. 9 is a perspective view of yet another embodiment of a contoured segment similar to the embodiment of FIG. 8.

FIG. 10 is a perspective view of the external fixator assembly incorporating the contoured segments of the embodiments of FIGS. 8 and 9.

FIG. 11 is a front view of the embodiment of FIG. 10.

FIG. 12 is a side view of the embodiment of FIGS. 10 and 11.

Like reference numerals refer to like parts throughout the several views of the drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As represented in the accompanying figures, the present invention is directed to an external fixator assembly generally indicated as 10. As demonstrated, the fixator assembly 10 is structured to be operatively positioned and used in a location substantially adjacent to the ankle area 12 of a patient, as best represented in FIG. 1. As set forth above, the ankle area 12 is meant to be descriptive of substantially the entire area represented in FIG. 1, which includes the ankle joint, foot, corresponding portions of the leg bones, including the fibula and tibia, as well as the associated components and tissue. In addition, the terms "height" and "length" of the ankle area 12 are used synonymously herein and refer to the distance from substantially the bottom of the foot, as at 14, to at least a portion the long bones of the leg, as at 16.

Accordingly, the external fixator assembly 10 comprises a support assembly generally indicated as 18 and including a base segment 20 and at least one contoured segment generally indicated as 22. As will be apparent in the description of the fixator assembly 10 hereinafter provided, the support assembly 18 may include more than one contoured segment 22 as schematically represented in FIG. 7, wherein two contoured segments 22 and 22' are operatively positioned relative to the ankle area 12. Further, the one or more contoured segments utilized may be selected from a larger plurality of contoured segments 22, 22', etc., which may differ from one another at least in dimension and configuration, as will be explained in greater detail hereinafter. With primary reference to FIG. 2, the base segment 20, defining at least a portion of the support assembly 18, preferably includes a curvilinear configuration which may be more specifically defined by an arcuate or

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semicircular shape. As such, the base segment **20** terminates in oppositely disposed free ends **23** and **23'**. Further, a plurality of apertures or other appropriate structure **25** are positioned substantially along the length of the base segment **20** and are provided to facilitate connection of one or more struts to the base segment **20** preferably using fixation bolts, which are not shown for purposes of clarity. Such struts and interconnecting fixation bolts are well-known in the medical profession and are used to support and/or dispose the base segment **20** in a stabilized position relative to the ankle area **12**. The opposite ends of such struts, to which the base segment **20** is connected, may be secured to a halo-type ring located above the ankle area **12** along the length of the leg and in surrounding relation to the bones **16'** of the leg **16**. The halo-type support ring is also well-known in the medical profession and is structured to have a plurality of transfixion pins secured thereto so as to extend radially inward into a firm connection with the bone(s) **16'** of the leg **16**. Such anchoring of the halo ring provides stabilizing support to the base segment **20** by virtue of the interconnection between the halo ring and the base segment **20** by the plurality of strut members, as is well-known.

Accordingly, as represented in FIGS. **1**, **3**, **4** and **5**, the base segment **20** is disposed in at least partially surrounding but spaced relation to a portion of the ankle area **12**, such as in the vicinity of the heel **12'**. For purposes of clarity, the plurality of apertures or like connecting facilities **25** are not pictured in FIG. **5** but are intended to be present therein during the actual practical application or use of the fixator assembly **10**. With further reference to both FIGS. **1** and **5**, operative placement and use of the fixator assembly **10** comprises the supported disposition of at least one contoured segment **22** or **22'** adjacent to an appropriate side of the ankle area **12**. More specifically, contoured segment **22'**, having the smaller or lesser protruding contoured portion **30** is normally placed adjacent the lateral side of the foot and/or ankle area **12**. In cooperation therewith, the contoured segment **22**, having the larger or greater outwardly protruding portion **30** is normally, but not exclusively, appropriately positioned adjacent the medial side of the foot and/or ankle area **12**.

As represented in FIG. **5**, operative disposition and use of the fixator assembly **10** may comprise utilization of two of the contoured segments **22** and **22'**, wherein each is connected to correspondingly disposed ends **23** and **23'** of the base segment **20**. It is noted that the interconnection of the one or more contoured segments **22** and **22'** to the base segment **20** may be removably connected, in a stable manner, through the use of appropriate connectors as at **29**. Alternatively, one or both of the contoured segments **22** and **22'** may be integrally or otherwise fixedly and therefore not removably secured to the base segment **20** in a manner which does not facilitate their disconnection from the base segment **20**.

With primary reference to FIGS. **3** and **4**, structural details of each of a plurality of contoured segments **22**, **22'**, **22''**, **22'''**, etc. are represented, wherein it is emphasized that common structural features do exist between each of a plurality of contoured segments **22**, **22'**, etc. However, each of a possible larger number of contoured segments **22**, **22'**, etc. may vary in dimension and configuration to accommodate accurate placement of a plurality of transfixion wires or members **36** relative to different ankle area **12** of different patients. Accordingly, it is emphasized that a large number of contoured segments may be made available to the involved medical personnel. This allows the appropriately dimensioned and configured contoured segment(s) to be selected and operatively utilized in different applications. Moreover, once selected, the one or more contoured segments **22**, **22'**, etc. are dimensioned and configured to properly position the required transfixion wires, pins or members **36** based, at least in part, on the needs of specific patient. The large number of contoured segments

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which may be provided also allows the medical personnel to quickly and easily choose an appropriately dimensioned and configured contoured segment to be used on an ankle area **12** of a patient dependent on the size and shape of that portion of a patient's body as well as a particular bones or other tissue which must be stabilized or otherwise treated.

Accordingly, each of the contoured segments **22**, **22'**, etc. includes a contoured portion generally indicated as **30** disposed in spaced relation to at least one end **32** thereof, but more practically in spaced relation to opposite ends **32** and **32'** thereof. As such, the contoured portion **30**, in at least one preferred embodiment of the fixator assembly **10**, is disposed intermediate the opposite ends **32** and **32'**. Also, one of these opposite ends, such as at **32**, is fixedly or removably connected to a correspondingly disposed end **23** of the base segment **20**. Further, each of the contoured segments **22**, **22'**, etc. comprise the contoured portion **30** having a substantially angular configuration as it protrudes transversely outward from a remainder of the length of the corresponding contoured segment **22**, **22'**, etc. Moreover, the angled configuration of each of the contoured portions **30** may be more specifically defined by a substantially convergent configuration as each of the contoured portions **30** extend transversely outward from a remainder of the corresponding contoured portion **22** and **22'**. Moreover, each of the contoured portions **30** terminates at what may be generally referred to as an apex or upper portion of the contoured portion **30**, as at **32**. Therefore, when one or more of the contoured segments **22**, **22'**, etc. are operatively positioned as represented in FIGS. **1** and **7**, a contoured portion **30** of each of the one or more contoured segments **22**, **22'**, etc. extends transversely outward from a remainder of the corresponding contoured segment **22** or **22'** along the height or length of the ankle area **12** as best demonstrated in FIG. **1**. Accordingly, each of the contoured segments **22**, **22'**, etc. are structured to be connected to and support one or more of a plurality of transfixion members or transfixion wires **36**, as represented in FIGS. **1** and **5**. As such, each of the one or more transfixion wires or pins **36** extend transversely inward, toward the appropriate portion of the ankle area **12**, from any one of a plurality of possible locations on the contoured segment **22**, **22'**, etc. including, but not limited to, being connected to the contoured portion **30** or other portions of the length of the corresponding contoured segment.

Therefore, it is emphasized that any of a larger plurality of contoured segments **22**, **22'**, etc. may be available to medical personnel to facilitate the application to ankle areas **12** of different sizes and/or where different bones or like tissue must be engaged by the transfixion members **36**. The differing size and/or configuration of the plurality of contoured segments **22**, **22'**, etc. is clearly represented in FIGS. **3** and **4**. As disclosed, the contoured portions **30** of the different contoured segments **22** and **22'** have the aforementioned angular configuration which may be more specifically defined by a substantially convergent configuration. However, the contoured portions **30** may differ in height and or placement along the length of the corresponding contoured segment **22** or **22'**. As such, the transversely outward location of the apex **33** may differ in the plurality of contoured segments collectively represented as **22** and **22'** in FIGS. **3** and **4**.

Therefore, it is emphasized that any of a larger plurality of contoured segments **22**, **22'**, etc. may be available to medical personnel to facilitate the application to ankle areas **12** of different sizes and/or where different bones or like tissue must be engaged by the transfixion members **36**. The differing size and/or configuration of the plurality of contoured segments **22**, **22'**, etc. is clearly represented in FIGS. **3** and **4**. As disclosed, the contoured portions **30** of the different contoured segments **22** and **22'** have the aforementioned angular configuration which may be more specifically defined by a

substantially convergent configuration. However, the contoured portions **30** may differ in height and or placement along the length of the corresponding contoured segment **22**, **22'**. As such, the transversely outward location of the apex **33** may differ in the plurality of contoured segments collectively represented as **22** and **22'** in FIGS. **3** and **4**.

As such, the contoured portions **30** of each of the contoured segments **22** and **22'** will be located adjacent and in operative relation to an at least minimally different portion of the various bones or other tissue of the ankle area **12**. This in turn will facilitate and enhance the versatility of accurately and efficiently placing one or more transfixion wires, pins or like members **36** into engaging, stabilizing relation to the intended bones or other tissue of the ankle area **12**. More specifically, as each of the contoured portions **30** of each contoured segment **22**, **22'**, etc. extend transversely outward from the remainder of the length of the corresponding contoured segments **22**, **22'**, etc., the ability to position one or more of the transfixion members **36** transversely inward into engaging relation with appropriate tissue of the ankle area **12** as represented by a comparison of the FIGS. **1** and **5**.

It is further emphasized that at least in one preferred embodiment represented in FIG. **7**, the use of two contoured segments **22** and **22'** may be typically accomplished by placement of each contoured segment **22** and/or **22'** on appropriate and/or lateral and medial sides respectively of the ankle area **12**. In this embodiment corresponding ends **32**, **23** and **32**, **23'** of the contoured segments **22**, **22'** and base segment **20** respectively are fixedly or removably connected to one another. However, a variance in the dimension and configuration of the base segment **20** may serve to alter the position of each or both of the contoured segments **22** and **22'** relative to the ankle area **12** and/or to one another, from that represented in FIG. **5**. In addition, a fixed or integral connection between the base segment **20** and one or more of the contoured segments **22** and **22'** allows the medical personnel to choose an appropriate size and configuration of the support assembly **18** defined by the base segment **20** and one or more of the non-detachable contoured segments **22** and **22'**. As such, a supply of the fixator assemblies **10** may be made available to medical personnel in predetermined and different sizes and configurations. This would alleviate the necessity of the medical personnel having to interconnect one or more of the contoured segments **22** and **22'** to the base segment **20**, such as by use of the connectors **29**.

Additional structural details of each of the plurality of contoured segments **22**, **22'**, etc. include the provision of a plurality of apertures **40**, or other appropriately structured connecting sites, along the length of the contoured portion **30** as well as the remainder of the length of the corresponding contoured segment **22**, **22'** etc. These apertures **40** facilitate the interconnection of the one or more transfixion members **36** thereto, such that the one or more transfixion members **36** may be located at any one of a plurality of locations along the contoured portion **30** as well as the remainder of the length of the contoured segment **22**, **22'**, etc. This further adds to the versatile and accurate placement of the transfixion member **36** along the entire length of the corresponding contoured segments **22**, **22'**, etc. Also, when each of the contoured segments **22**, **22'**, etc. are fixedly but removably connected to the appropriate ends as at **23** and **23'** of the base segment **20**, additional apertures or other appropriate structures may be provided to facilitate placement of an appropriate connector **29**, as represented in FIG. **1**. It is further emphasized that when two contoured segments are used, as in the embodiment of FIG. **5**, they may comprise different or substantially equivalent dimensions and configurations, dependent on the medical requirements in the stabilization or other treatment of the ankle area **12**.

Yet another preferred embodiment of the external fixator assemble is represented in FIGS. **6** and **7** and generally indicated as **10'**. As such, the fixator assembly **10'** includes a base segment **20** and at least one or, as set forth above, a plurality of at least two contoured segments **122** and **122'**. Further, each of the contoured segments **122** and **122'** include the contoured portion **30** extending transversely outward from a remainder of the length of the respective contour segments **122** and **122'**. Also, each of the contoured portions **30** include what may be generally referred to as an apex **33**, as indicated in the additional embodiments of the present invention described above. Each of the one or more contoured segments **122** and/or **122'** may be fixedly and/or integrally connected to the base segment **20** by connecting correcting ends **23'**, **32** as relates to the contoured segment **122**. Similarly the contoured segment **122'** may be fixedly and/or integrally connected at corresponding ends **23**, **32** as indicated in FIG. **6**. Alternatively, as also described with regard to the above noted embodiments, the contoured segments **122** and **122'** may be removably connected to corresponding ends of the base segment **20** by appropriate connectors **29**, as generally referred to FIG. **1**.

In addition, the base segment **20** may include a plurality of apertures or like connecting sites **25** extending along the length thereof. Somewhat similarly, the length of the contoured segments **122** and **122'** include connecting apertures or like connecting site structures **40** along their lengths, as well as along the length of the contoured portions **30** in the manner represented in FIG. **1**. Additional structural modifications present in the embodiment of FIGS. **6** and **7** include intermediate segment **50** disposed in interconnecting relation between opposite ends **32** and **32'** of each of the contoured segments **122** and **122'**. Further, the intermediate segments **50** of each of the contoured segments **122** and **122'** are preferable disposed in spaced relation to and generally beneath the corresponding contoured portions **30**, when the corresponding contoured segments **122** and **122'** are in the orientation represented in FIGS. **6** and **7**. Moreover, the intermediate segments **50** are disposed and structured to provide additional support, structural integrity and stability to the respective contour segments **122** and **122'**. Further, connecting aperture or sites **40** may also be located along the length of the intermediate segment **50** of each of the contoured segments **122** and **122'**, so as to facilitate the connection or mounting of transfixion pins, wire or like members, as they extend transversely inward from the corresponding intermediate segment **50** into and towards the ankle assembly **12**, as schematically represented in FIG. **5**.

For purposes of clarity in further describing the intended disposition and structure of the intermediate segment(s) **50**, additional schematic representations are presented in FIGS. **3** and **4**, in phantom lines. However, it is emphasized that the embodiments of the contoured segments **22** and **22'** as originally described, are absent the schematically represented intermediate segments **50**. Moreover, in the schematic representation presented in phantom lines, the intermediate segments **50** are disposed in spaced relation beneath the corresponding contoured portions **30** and along the length thereof and in axially aligned, interconnecting relation between the remaining end portions **32** and **32'**.

Additional structural features of the embodiments of FIGS. **6** and **7** include the intermediate segments **50** preferably being integrally formed with the remaining opposite ends **32** and **32'** of the respective contoured segments **122** and **122'**. However, other means of mounting, connecting and otherwise structuring the intermediate segments **50** relative to the remaining length and ends **32** and **32'** of the contour segments **122** and **122'** may be appropriate, provided that the strength, stability and structural integrity of the contoured segments **122** and **122'** are appropriately enhanced.

Yet another embodiment of the present invention is represented in FIGS. 8-12 and comprises an external fixator assembly 200 including a support assembly generally indicated as 218. As with the preferred embodiments of FIGS. 1-7, the external fixator assembly 200 is structured to be operatively positioned and used in a location substantially adjacent to the ankle area 12 of a patient as best represented in FIG. 1.

More specifically, the external fixator assembly 200, including the support assembly 218, includes at least one but in many practical applications, two contoured segments 222 and 222' as respectively represented in FIGS. 8 and 9. As with the embodiment of FIG. 2, the base segment 220 defines at least a portion of the support assembly 218 and includes an inner peripheral edge or portion 221 having a substantially curvilinear configuration so as to accommodate placement of the heel or rear portion of the patient's foot, as also demonstrated in the embodiment of FIG. 1. In contrast, the outer peripheral edge as at 221' may have a straight, linear configuration in contrast to the overall arcuate or semi-circular configuration of the base 20 on the embodiment of FIG. 2. Further, the base segment 220 terminates at oppositely disposed free ends 223 and 223'. Each of the opposite ends 223 and 223' are fixedly and/or integrally connected to a lateral side portion 232' disposed adjacent the end 232 of each of the contoured segments 222 and 222'.

While not represented in the embodiment in FIG. 10, the base 220 may also include a plurality of apertures or other structures 25, as represented in FIG. 2, which are positioned substantially along the length of the base segment 220. These apertures or appropriate structures 225 are provided to facilitate connection of one or more struts to the base segment 220 preferably using appropriate fixation bolts or other means of connection. As set forth above, such struts may facilitate the connection of the base 220 and/or the overall support assembly 218 to one or more halo-type rings. As is common, such halo-type rings extend along the length of the leg, generally above the ankle area 12 in surrounding relation to the bones 16 and 16', as described above with reference to the embodiment of FIG. 1.

A comparison of the preferred embodiment of FIG. 12 and with additional reference to the embodiment of FIGS. 1 and 5, operative placement of the fixator assembly 200 comprises the supported disposition of one or both of the contoured segments 222 and 222' adjacent to an appropriate side of the ankle area 12. As represented in FIGS. 8 and 9, it is emphasized that common structural features exist between each of the two contoured segments 222 and 222'. Further, each of a possible larger number of contoured segments may vary in dimension and configuration to accommodate accurate placement of a plurality of transfixion wires or members 36 relative to the ankle area 12 of different patients. Moreover, each of the contoured segments 222 and 222' include a contoured portion generally indicated as 230. The contoured portion 230 of each of the contoured segments 222 and 222' is disposed in spaced relation to at least one end 232 thereof, but more practically in spaced or intermediate relation to the opposite ends 232 and 232' of corresponding ones of the contoured segments 222 and 222'. Each of the contoured portions 230 comprises a substantially angular, convergent configuration as the contoured portion 230 extends or protrudes transversely outward from a remainder of the length of a corresponding one of the contoured segments 222 and 222' and along the length or height of the ankle area 12. More specific structural features of each of the contoured portions 230 comprise spaced apart legs 231 and 233 having their inner or proximal ends connected integrally or otherwise fixedly connected to the corresponding contoured segment 222 or 222', as at 237 and 237'. The outer or distal ends of each of the spaced apart legs 231 and 233 are integrally or fixedly connected to a bridge member 235, as at 238 and 238'. As clearly

represented in FIGS. 8 and 9, the bridge member 235 of each of the contoured portions 230 is disposed between and in interconnecting relation to the spaced apart arms 231 and 233 an integral junction or connection, 238 and 238'.

Another clearly distinguishing structural feature associated with the embodiments of the contoured segments 222 and 222' as represented in FIGS. 8 and 9, as compared to the embodiments of FIGS. 1-7, include each of the legs 231 and 233 as well as the bridge member 235 having an outer surface with a flat, substantially planar configuration extending along the respective lengths thereof. Such flat, substantially planar configurations are represented respectively as 231', 233' and 235' and are structured into this configuration so as to facilitate stable and secure connection, support and placement of at least one but more practically a plurality of transfixion members 36 in any one of a plurality of different orientations as the transfixion members 36 extend into supporting, stabilizing relation to the ankle area 12, as represented in the above described embodiment of FIG. 5. It is emphasized that the flat, substantially planar configuration of the outer surfaces 231', 233' and 235' are not merely design choices but serve a specific, practical application by facilitating the stable placement, support and connection of the aforementioned transfixion members 36 at any point along the length of any one of the arms 231 or 233 as well as the bridge member 235.

In order to add operational versatility in the accurate and appropriate placement of the transfixion members 36, again as represented in FIG. 5, each of the arms 231 and 233 of each of the contoured portions 230 are arranged at a different angular orientation relative to one another and to the bridge member 235. Similarly, the bridge member 235 and/or the outer surface 235' thereof is angularly inclined relative to each of the outer surfaces 231' and 233' of the respective arm members 231 and 233. Moreover, a comparison between the embodiments of FIGS. 8 and 9 indicate a different "height" or distance of protrusion of the contoured portions 230 of the respective contoured segments 222 and 222'. As set forth above, this difference in heights of the contoured portions 230 facilitate a preferred positioning of the contoured segment 222 along the medial portion of the foot and the contoured segment 222' along the lateral portion of the foot and ankle.

Therefore, due to the fact that the dimension and overall configuration of each of the contoured segments 222 and 222' as well as the corresponding contoured portions 230 may vary, the plurality of transfixion wires, pins or members 36 may be located at different heights and orientations. At any of the different heights or varying angular orientations, the transfixion members 36 will be directed transversely inward into engaging relation to the intended bone or tissue of the ankle 12 which is being stabilized in the manner set forth above relating to the description of the embodiments of FIGS. 1 and 5. Yet additional structural details of each of the contoured segments 222 and 222' include the provision of a plurality of apertures 40 or other appropriately structured connecting sites extending along the length of each of the contoured portions 230 and possibly along the remainder of the length of the corresponding contoured segments 222 and 222'. These apertures 40 are clearly represented and described with regard to the embodiment of FIGS. 5 and 6 and are equally applicable to the embodiments of FIGS. 8-12. As set forth above, these apertures 40 facilitate the interconnection of one or more transfixion members 36 thereto which facilitates the one or more transfixion members 36 being located at any one of a plurality of locations and/or orientations along the contoured portion 230 of each of the contoured segments 222 and 222'.

Further structural and operative features associated with the different preferred embodiments of the contoured segments 222 and 222' represented in FIGS. 8 and 9 is the provision of a substantially flat, planar inner surface 231", 233" and 235" formed on the under or inner portion of the

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spaced apart arms **231**, **233** as well as the bridge member **235** respectively. Again, the structuring and specific configuring of both the inner and outer surfaces of the spaced apart leg members **231** and **233**, as well as the bridge member **235** serves to greatly enhance the ability to securely connect, support and position a plurality of fixation members **36** in any one of a plurality of different angular orientations or locations. As such, any one or more connected fixation members **36** may be accurately disposed into an appropriate stabilizing position relative to the ankle area **12** including the bones and various components thereof.

Since many modifications, variations and changes in detail can be made to the described preferred embodiment of the invention, it is intended that all matters in the foregoing description and shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense. Thus, the scope of the invention should be determined by the appended claims and their legal equivalents.

Now that the invention has been described,

What is claimed is:

1. A fixator assembly structured for use adjacent the ankle area of the body, said fixator assembly comprising:

a support disposed adjacent the ankle area and structured to support at least one transfixion member in operative engagement with a predetermined portion of the ankle area,

said support including a base segment and two elongated contoured segments extending from said base segment, each of said contoured segments including a contoured portion,

each of said contoured portions comprising elongated, spaced apart leg members and a bridge member disposed in interconnecting relation to said leg members, each of said contoured portions structured to connect at least one transfixion member at any one of a plurality of spaced apart locations along a length of the contoured portion,

each of said contoured portions structured and configured to connect the at least one transfixion member in a transversely inward orientation and into engagement with the ankle area from any one of a plurality of locations along the length of the corresponding contoured portion, and said bridge member and said outer surfaces thereof being at least partially angularly inclined relative to the length of the contoured segment.

2. A fixator assembly as recited in claim **1** wherein each of said outer surfaces is structured to support and dispose at least one transfixion member at any one of a plurality of different orientations thereon relative to the ankle area.

3. A fixator assembly as recited in claim **1** wherein said base segment and said two elongated contoured segments are integrally formed with one another.

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4. A fixator assembly as recited in claim **1** wherein each of said contoured portions comprise an arched configuration.

5. A fixator assembly structured for use adjacent the ankle area of the body, said fixator assembly comprising:

a support disposed adjacent the ankle area and structured to support at least one transfixion member in operative engagement with a predetermined portion of the ankle area,

said support including a base segment and two elongated contoured segments extending from said base segment, each of said contoured segments including a contoured portion,

each of said contoured portions comprising elongated, spaced apart leg members and a bridge member disposed in interconnecting relation to said leg members,

each of said contoured portions structured to connect at least one transfixion member at any one of a plurality of spaced apart locations along a length of the contoured portion,

each of said contoured portions structured and configured to connect the at least one transfixion member in a transversely inward orientation and into engagement with the ankle area from any one of a plurality of locations along the length of the corresponding contoured portion, and said base segment and said two elongated contoured segments being adjustably attached to one another.

6. A fixator assembly structured for use adjacent the ankle area of the body, said fixator assembly comprising:

a support disposed adjacent the ankle area and structured to support at least one transfixion member in operative engagement with a predetermined portion of the ankle area,

said support including a base segment and two elongated contoured segments extending from said base segment, each of said contoured segments including a contoured portion,

each of said contoured portions comprising elongated, spaced apart leg members and a bridge member disposed in interconnecting relation to said leg members, each of said contoured portions structured to connect least one transfixion member at any one of a plurality spaced apart locations along a length of the contoured portion, each of said contoured portions structured and configured to connect the at least one transfixion member in a transversely inward orientation and into engagement with the ankle area from any one of a plurality locations along the length of the corresponding contoured portion, and

each of said leg members and a corresponding one of said bridge portions being at least partially defined by a substantially flat portion, said flat portions being disposed at different angles relative to one another and relative to a length a corresponding one of said contoured segments.

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